

*Release of  
February 2016  
MCAS Biology  
Test Items*

**March 2016  
Massachusetts Department of  
Elementary and Secondary Education**



This document was prepared by the  
Massachusetts Department of Elementary and Secondary Education  
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Commissioner

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# *Commissioner's Foreword*

Dear Colleagues:

The Massachusetts Department of Elementary and Secondary Education is committed to working in partnership with schools to support a system that will prepare all students to succeed as productive and contributing members of our democratic society and the global economy. To assist in achieving this goal, the Department regularly releases Massachusetts Comprehensive Assessment System (MCAS) test items to provide information about the kinds of knowledge and skills that students are expected to demonstrate. This publication contains all MCAS February Biology items on which student scores are based.

The Department has banked thousands of MCAS items that are currently posted on the Department website. These items, which are available at [www.doe.mass.edu/mcas/testitems.html](http://www.doe.mass.edu/mcas/testitems.html), will continue to be a rich resource for schools.

This publication is available only on the Department website. The test items can be printed from this site. I encourage educators to use the relevant sections of this document together with their test item analysis reports as guides for planning changes in curriculum and instruction that may be needed to support schools and districts in their efforts to improve student performance.

Thank you for your support as we work together to strengthen education for our students in Massachusetts.

Sincerely,

Mitchell D. Chester, Ed.D.

Commissioner of Elementary and Secondary Education

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# I. Document Purpose and Structure

# Document Purpose and Structure

## Purpose

The purpose of this document is to share with educators and the public the February 2016 MCAS Biology test items on which student results are based. Local educators will be able to use this information to identify strengths and weaknesses in their curriculum and to plan instruction to more effectively meet their students' individual needs.

This document is also intended to be used by school and district personnel as a companion document to test item analysis reports. The reports list, for the school accessing the report, the names of all enrolled students who took the February 2016 Biology test as well as information about how each student answered each common test item contained in this document. The reports also label each item as multiple-choice or open-response and identify the item's MCAS reporting category. Item numbers in this document correlate directly to the item numbers in the test item analysis reports.

## Structure

Chapter II of this document contains information for the February 2016 Biology test and has three main sections. The **first section** introduces the chapter by listing the Massachusetts curriculum framework content strands assessed by the Biology MCAS test. These content strands are identical to the MCAS reporting categories under which test results are reported to schools and districts. The first section also provides the Web address for the *Science and Technology/Engineering Curriculum Framework* and the page numbers on which the learning standards assessed by the test items in the chapter can be found. In addition, there is a brief overview of the test (number of test sessions, types of items, and reference materials allowed).

The **second section** contains the test items used to generate February 2016 MCAS student results for Biology. The test items in this document are shown in the same order and basic format in which they were presented in the test booklet.

The **final section** of the chapter is a table that cross-references each item with its MCAS reporting category and with the *Framework* standard it assesses. Correct answers to multiple-choice questions are also listed in the table.

Materials presented in this document are **not** formatted **exactly** as they appeared in student test booklets. For example, in order to present items most efficiently in this document, the following modifications have been made:

- Some fonts and/or font sizes may have been changed and/or reduced.
- Some graphics may have been reduced in size from their appearance in student test booklets; however, they maintain the same proportions in each case.
- All references to page numbers in answer booklets have been deleted from the directions that accompany test items.

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## II. February 2016 Biology Test

## February 2016 Biology Test

The February 2016 high school MCAS Biology test was based on learning standards in the Biology content strand of the Massachusetts *Science and Technology/Engineering Curriculum Framework* (2006). These learning standards appear on pages 54–58 of the *Framework*, which is available on the Department website at [www.doe.mass.edu/frameworks/current.html](http://www.doe.mass.edu/frameworks/current.html).

Biology test results are reported under the following five MCAS reporting categories:

- Biochemistry and Cell Biology
- Genetics
- Anatomy and Physiology
- Ecology
- Evolution and Biodiversity

The table at the conclusion of this chapter indicates each item’s reporting category and the framework learning standard it assesses. The correct answers for multiple-choice questions are also displayed in the table.

### Test Sessions

The MCAS high school Biology test included two separate test sessions, which were administered on consecutive days. Each session included multiple-choice and open-response items.

### Reference Materials and Tools

The high school Biology test was designed to be taken without the aid of a calculator. Students were allowed to have calculators with them during testing, but calculators were not needed to answer questions.

During both Biology test sessions, the use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only. No other reference materials were allowed.



# Biology

## SESSION 1

### DIRECTIONS

This session contains twenty-one multiple-choice questions and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet. You may work out solutions to multiple-choice questions in the test booklet.

- 1 Structures called microtubules are found in the cytoplasm of most eukaryotic cells. Microtubules are made up of proteins and help shape and support the cell.

Which of the following elements are most abundant in microtubules?

- A. lead and zinc
- B. nitrogen and carbon
- C. sodium and chlorine
- D. iodine and magnesium

- 2 Under which of the following conditions would an animal population **most likely** survive the effects of rapid climate change?

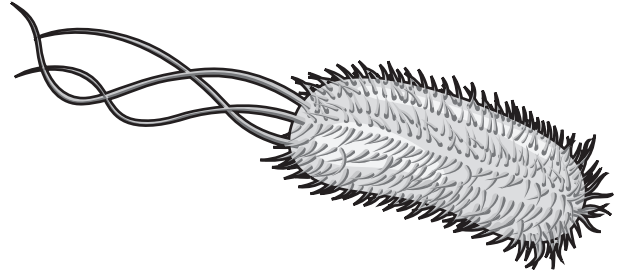
- A. The population is highly mobile.
- B. The population has a small geographic range.
- C. The individuals in the population are carnivorous.
- D. The females in the population have one or two offspring per litter.

- 3 In 1995, 15 iguanas of the species *Iguana iguana* floated to the Caribbean island of Anguilla on a tree uprooted by a hurricane. No other iguanas of that species existed on Anguilla. Scientists think that the iguanas came from the island of Guadeloupe, about 120 km southeast of Anguilla.

Which of the following factors has the **most** influence on whether the iguanas on Anguilla will become a separate species from the iguanas on Guadeloupe over time?

- A. how long ago the island of Anguilla was formed
- B. how much variation there is in the body size of the iguanas
- C. how many base pairs are in the DNA sequence of the iguanas
- D. how different the environment on Anguilla is from that on Guadeloupe

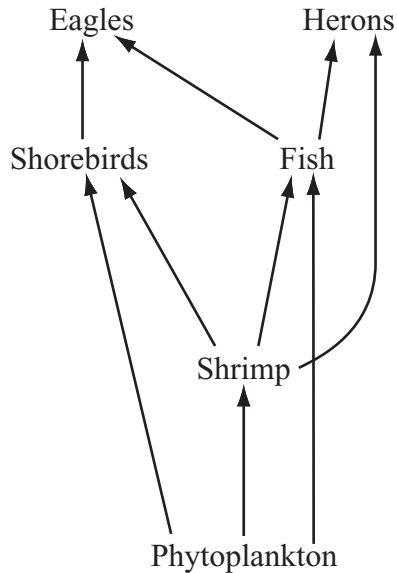
- 4 The illustration below shows the external features of a prokaryotic organism.



Which of the following can be concluded about the internal cellular contents of this prokaryote?

- A. The cell does not contain ribosomes.
- B. The cell does not contain a nucleus.
- C. The cell contains mitochondria.
- D. The cell contains a vacuole.

- 5 The diagram below shows part of a food web in a salt marsh.



Which organisms in the food web belong to the trophic level that provides the most available energy to the ecosystem?

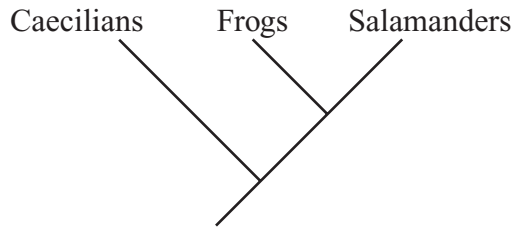
- A. herons
- B. phytoplankton
- C. shorebirds
- D. shrimp

- 6 In the human heart, a group of cells in the wall of the right atrium produces nerve impulses that stimulate cardiac muscle. What do these nerve impulses directly control?

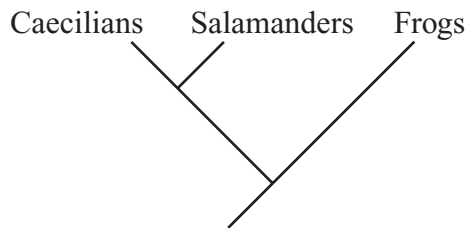
- A. the amount of oxygen in the blood
- B. the release of platelets into the blood
- C. the speed at which the heart pumps blood
- D. the path blood takes when it leaves the heart

7

The three orders of amphibians living today are caecilians, frogs, and salamanders. The cladogram below represents how scientists once thought these amphibian orders were related.



Based on more recent evidence, scientists developed a new hypothesis to explain the evolutionary relationships among amphibian orders, as represented in the cladogram below.



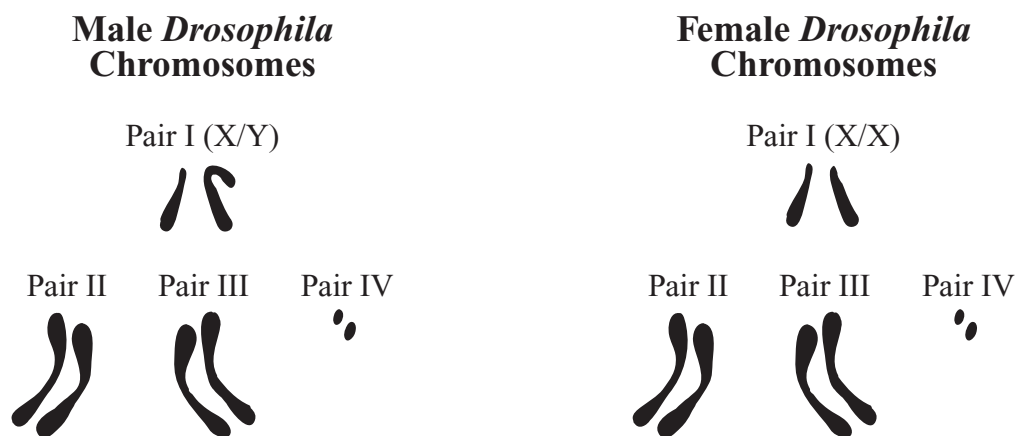
What evidence **most likely** led scientists to revise their hypothesis about how amphibians are related?

- A. Embryos showed that salamanders and frogs have many common structures during development.
- B. The fossil record showed that there are more extinct caecilians and salamanders than extinct frogs.
- C. Comparisons of DNA sequences showed that the DNA of modern caecilians and salamanders are most similar to each other.
- D. Comparisons of skeletal structures showed that the skeletons of fossil salamanders and modern frogs are most similar to each other.

The following section focuses on fruit fly genetics.

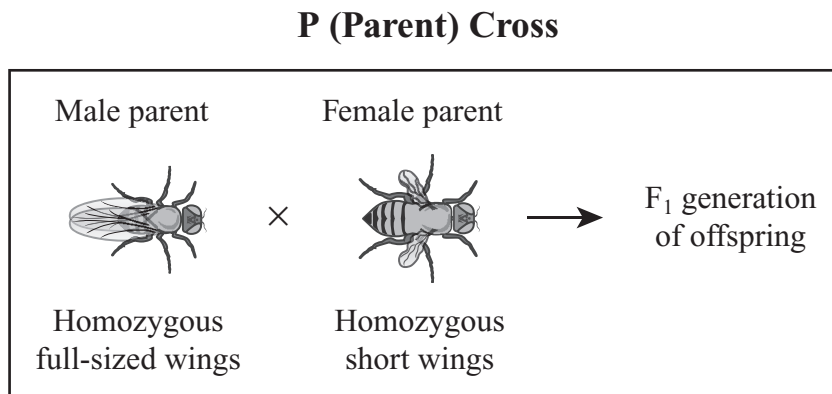
Read the information below and use it to answer the four multiple-choice questions and one open-response question that follow.

Since the early 1900s, scientists have been studying the inheritance patterns of genetic traits in the fruit fly *Drosophila*. In *Drosophila*, genetic information is stored in four chromosome pairs. The diagrams below show the chromosome pairs in male and female *Drosophila* body cells.



One of the genetic traits scientists have studied in *Drosophila* is wing structure. Inheritance of full-sized wings versus short wings follows a pattern of complete dominance. The allele for full-sized wings (**H**) is dominant, and the allele for short wings (**h**) is recessive. Individuals with short wings are not able to fly.

The diagram below represents one particular type of cross between parent *Drosophila* flies. The offspring produced are the  $F_1$  generation.



Mark your answers to multiple-choice questions 8 through 11 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet, but you may work out solutions to multiple-choice questions in the test booklet.

8 In which of the following cell structures are the *Drosophila* chromosomes located?

- A. lysosome
- B. nucleus
- C. ribosome
- D. vacuole

9 In which *Drosophila* cross would 100% of the offspring be expected to have the short-wing phenotype?

- A. heterozygous male × heterozygous female
- B. heterozygous male × homozygous recessive female
- C. homozygous dominant male × heterozygous female
- D. homozygous recessive male × homozygous recessive female

10 Full-sized wings are the typical phenotype for *Drosophila*. Which of the following events **most likely** led to the existence of the short-wing allele in *Drosophila*?

- A. a change in the shape of a chromosome
- B. a change in the DNA sequence of a gene
- C. the insertion of a DNA strand during mitosis
- D. the deletion of a chromosome during meiosis

11 Which type of molecule do *Drosophila* chromosomes primarily contain?

- A. DNA
- B. RNA
- C. lipids
- D. monosaccharides

Question 12 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 12 in the space provided in your Student Answer Booklet.

- 12** The P cross between the male and female parent *Drosophila* flies produces the F<sub>1</sub> generation of offspring. Based on the genetic traits of the parents in the cross, scientists can predict the genotypes and phenotypes of the offspring.
- Using allele symbols, identify the genotype of the male parent fly in the P cross.
  - Using allele symbols, identify the genotype of the female parent fly in the P cross.
  - Determine the expected percentage of each phenotype in the F<sub>1</sub> generation of offspring. Draw a Punnett square to support your answer.
  - Explain why a fly in the F<sub>1</sub> generation can have the same phenotype but a different genotype than one of the parent flies. Include specific information from the cross to support your answer.

Mark your answers to multiple-choice questions 13 through 22 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet, but you may work out solutions to multiple-choice questions in the test booklet.

- 13 A body cell of a sand dollar has 52 chromosomes. How many chromosomes should a sand dollar gamete contain?

A. 26  
B. 52  
C. 78  
D. 104

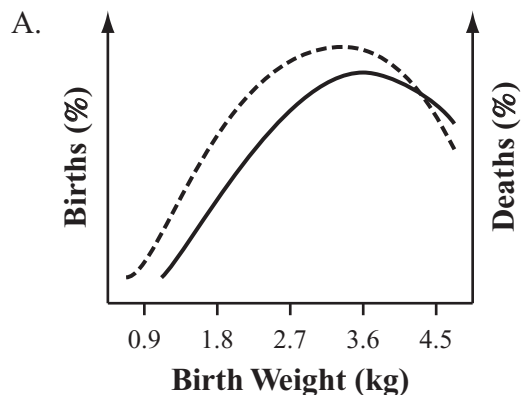
- 14 An English doctor is given credit for developing the modern terrarium in the 1800s. The doctor kept some plants in a sealed glass jar containing soil and air. The plants survived in the sealed jar for four years.

What two processes allowed the plants to cycle nutrients and survive in the sealed jar?

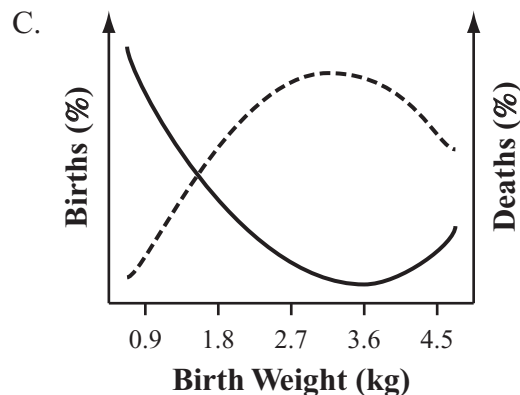
A. meiosis and fertilization  
B. mutualism and commensalism  
C. photosynthesis and cellular respiration  
D. asexual reproduction and sexual reproduction



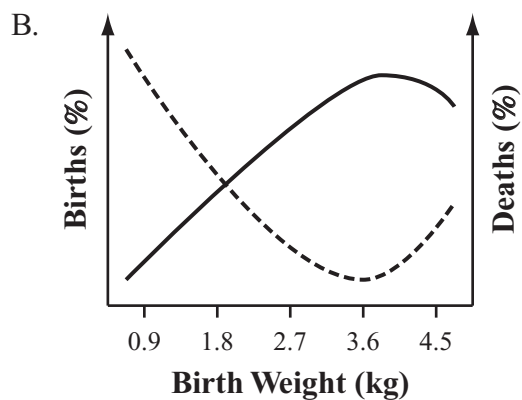
- 15 Prior to recent medical advances, natural selection favored human infants with intermediate birth weights of around 3.6 kg. Which of the following graphs shows the distribution of birth weights and the corresponding death rates under this selection pressure?



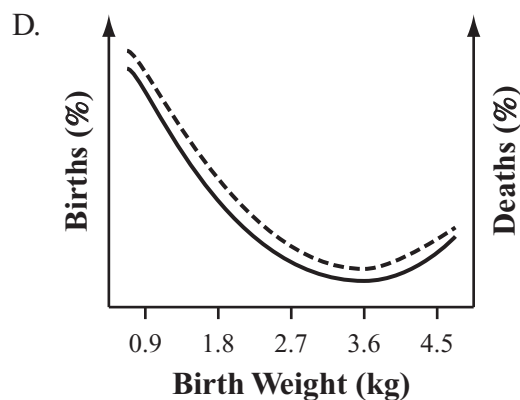
--- Deaths — Births



--- Deaths — Births

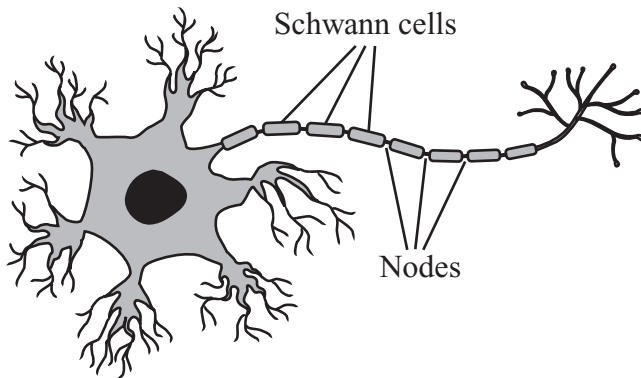


--- Deaths — Births



--- Deaths — Births

- 16 The axons of some vertebrate neurons are wrapped with special cells called Schwann cells, as shown below.



Which type of signal jumps from node to node between the Schwann cells to move down the axon?

- A. a digital pulse
- B. a magnetic pulse
- C. an electrical signal
- D. a glycoprotein signal

- 17 Which of the following types of organisms have cell walls composed of cellulose?

- A. amoebas
- B. birds
- C. grasses
- D. worms

- 18 The larvae of the common sulphur butterfly can be light green or bright yellow. Birds prey on the larvae, which are found on the green leaves of alfalfa plants.

Based on the theory of natural selection, which of the following would scientists expect to observe in populations of common sulphur butterfly larvae?

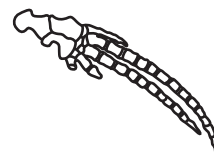
- A. All the green larvae develop yellow stripes before metamorphosis.
- B. All the yellow larvae and none of the green larvae are eaten by birds.
- C. The percentage of green larvae in the population is much greater than the percentage of yellow larvae.
- D. The percentages of green larvae and yellow larvae in the population remain equal for many generations.

- 19 Volcanic eruptions add carbon dioxide to the atmosphere. Which of the following also adds carbon dioxide **directly** to the atmosphere?

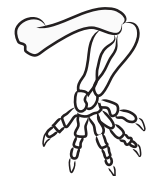
- A. burning a forest
- B. forming fossil fuels
- C. evaporation of a puddle
- D. erosion of igneous rocks

- 20 The forelimbs of a whale and an alligator have a similar structure, as shown below.

Whale



Alligator



Which of the following statements **best** explains this similarity in structure?

- A. The whale and the alligator evolved at the same time.
- B. The whale and the alligator have a recent common ancestor.
- C. The whale and the alligator spend all of their time in the water.
- D. The whale and the alligator have the same method of locomotion.

- 21 Populations of a European salamander, *Proteus anguinus*, live in underground caves that have a limited food supply. One of the salamander's adaptations is the ability to significantly reduce its rate of metabolism when food is scarce. Which of the following statements **best** describes how the process of natural selection led to this adaptation?
- A. Salamanders with the ability to slow their metabolism grew more slowly than other salamanders.
  - B. Salamanders with the ability to slow their metabolism were more likely to emigrate than other salamanders.
  - C. Salamanders with the ability to slow their metabolism underwent more rapid mutation than other salamanders.
  - D. Salamanders with the ability to slow their metabolism were more likely to survive and reproduce than other salamanders.

- 22 When astronauts are in low-gravity environments, their bodies begin to release stored calcium. As a result, which of the following **most likely** occurs when an astronaut returns to Earth?
- A. The risk of inflamed tendons increases.
  - B. The chance of breaking a bone increases.
  - C. The stomach's level of functioning decreases.
  - D. The blood's ability to carry oxygen decreases.

Question 23 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 23 in the space provided in your Student Answer Booklet.

**23** At high altitudes, air is less dense than at sea level because of decreased air pressure. This means that a person who ascends to high altitudes takes in fewer oxygen molecules per breath.

- a. Describe and explain an immediate response that occurs in the respiratory system when a person first reaches high altitudes.
- b. Describe and explain an immediate response that occurs in the circulatory system when a person first reaches high altitudes.

If a person lives at high altitudes for an extended period of time, other body responses occur. One response is an increase in the number of red blood cells.

- c. Explain how this response is helpful to the body.

At high altitudes, air temperature is also generally colder than at sea level.

- d. Describe and explain one internal body response that occurs when a person has been outside long enough for his core temperature to drop.

# Biology

## SESSION 2

### DIRECTIONS

This session contains nineteen multiple-choice questions and three open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet. You may work out solutions to multiple-choice questions in the test booklet.

- 24 Cowbirds are birds that lay their eggs in the nests of smaller birds such as warblers. The cowbird eggs develop quickly and usually hatch first. As a result, the larger cowbird chicks get most of the food and may push the smaller warbler chicks out of the nest. The warbler parent birds do not seem to know that the cowbird chicks are different from their own offspring. The original range of the cowbirds' habitat was limited to the Midwest prairies. Today, cowbirds are found in all states in the continental United States.
- Which of the following describes the most likely way that the expansion of the cowbirds' range has affected warblers?
- A. Warbler population sizes have decreased.
  - B. Warbler eggs have become larger in size.
  - C. Warblers have increased their birth rates.
  - D. Warblers have become less protective of their nests.

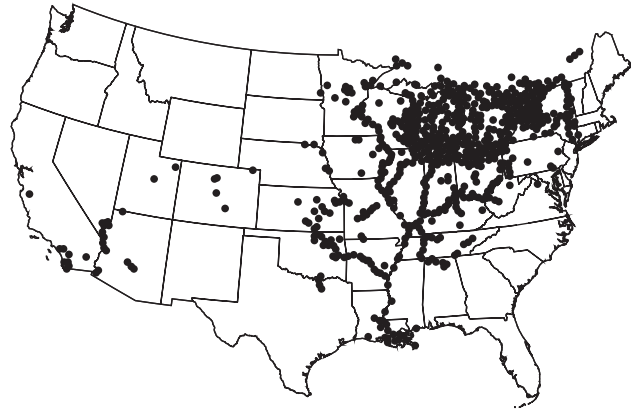
- 25 In cells, aerobic respiration (cellular respiration in the presence of oxygen) is more efficient than anaerobic respiration (cellular respiration in the absence of oxygen). This is because aerobic respiration produces more of which of the following substances?
- A. ATP
  - B. DNA
  - C. glucose
  - D. protein

- 26 In the past, coyotes lived throughout the western prairies and central Rocky Mountains in North America. Over time, the coyotes' range has expanded. Humans have tried trapping and hunting coyotes to decrease their numbers. However, biologists currently estimate the number of coyotes to be at an all-time high.

Which of the following statements **best** explains why the number of coyotes continues to increase despite increases in death rates due to hunting and trapping?

- A. Coyote lifespan is increasing, so only the oldest coyotes encounter hunters or trappers.
- B. Coyote birth rates remain high, so more coyotes are added to the population than are removed.
- C. Coyotes are migrating more often, so male coyotes have more fights over territories.
- D. Coyotes have to compete with more species, so the coyote emigration rate has increased.

- 27 The zebra mussel is a highly invasive species that was accidentally introduced to the Great Lakes region of the United States in the 1980s. The map below shows the distribution of zebra mussels in 2010.



• Zebra mussel location

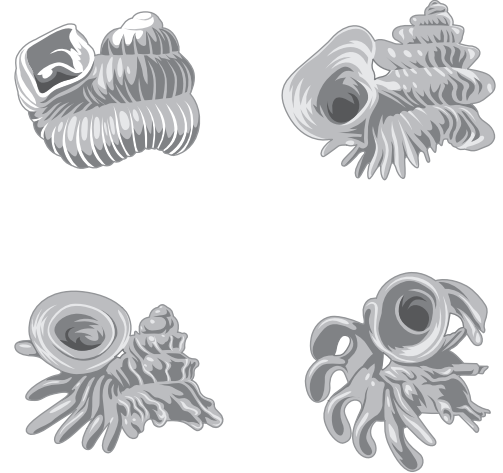
What is the primary reason the large-scale spread of zebra mussels concerns scientists?

- A. Zebra mussels are a freshwater species.
- B. Zebra mussels are a desired food for humans.
- C. Zebra mussels are eaten by some fish and birds.
- D. Zebra mussels outcompete native mussel species.

- 28 Earth's atmosphere is 20.9% molecular oxygen ( $O_2$ ). Which process provides **most** of the oxygen in the atmosphere?

A. cellular respiration  
B. osmosis  
C. photosynthesis  
D. transpiration

- 29 The pictures below show the shells of some species of land snails found on a Pacific island. Each species was found on a different hill on the island.



Based on the snails' shell shapes, scientists made hypotheses about the evolutionary relationships among the snails. Which of the following would be the **best** characteristic to compare in order to test these hypotheses?

A. the size of the snails  
B. the diet of the snails  
C. the DNA of the snails  
D. the average age of the snails



- 30** An altered form of the structural protein collagen causes a condition in which bones are weak and break easily. Which of the following are components of collagen?
- A. amino acids
  - B. fatty acids
  - C. monosaccharides
  - D. nucleotides
- 31** The stored information in DNA codes for which of the following?
- A. proteins
  - B. simple sugars
  - C. mitochondria when energy is needed
  - D. large vacuoles when nutrients are abundant

Question 32 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 32 in the space provided in your Student Answer Booklet.

- 32** The table below gives the common names, scientific names, and known geographic locations of several wild cats.

Common Name	Scientific Name	Main Geographic Location(s)
African lion	<i>Panthera leo</i>	Africa
Bengal tiger	<i>Panthera tigris</i>	Bangladesh, Bhutan, China, India, Myanmar, Nepal
Cheetah	<i>Acinonyx jubatus</i>	Africa
Indochinese tiger	<i>Panthera tigris</i>	Thailand, Cambodia, China, Laos, Myanmar, Vietnam
Leopard	<i>Panthera pardus</i>	Africa, China, India
Ocelot	<i>Leopardus pardalis</i>	South America, Central America
Sumatran tiger	<i>Panthera tigris</i>	island of Sumatra

- Using their common names, identify **all** the wild cats listed in the table that belong to the same genus.
- Identify **and** explain one type of evidence scientists could have used to classify these wild cats.

The three kinds of tigers listed in the table are all classified as one species.

- Based on the information in the table, identify which kind of tiger has the greatest chance of becoming a separate species. Explain your answer.
- Describe how scientists could determine if one of the kinds of tigers becomes a separate species.

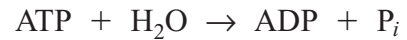
Mark your answers to multiple-choice questions 33 through 43 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet, but you may work out solutions to multiple-choice questions in the test booklet.

- 33 Secretions from the pancreas contain compounds called lipases. Lipases increase the rate of digestion of lipids.

Lipases are an example of which of the following?

- A. enzymes
- B. hormones
- C. nucleic acids
- D. simple sugars

- 34 ATP molecules in cells undergo a process called hydrolysis. The equation below represents this process.

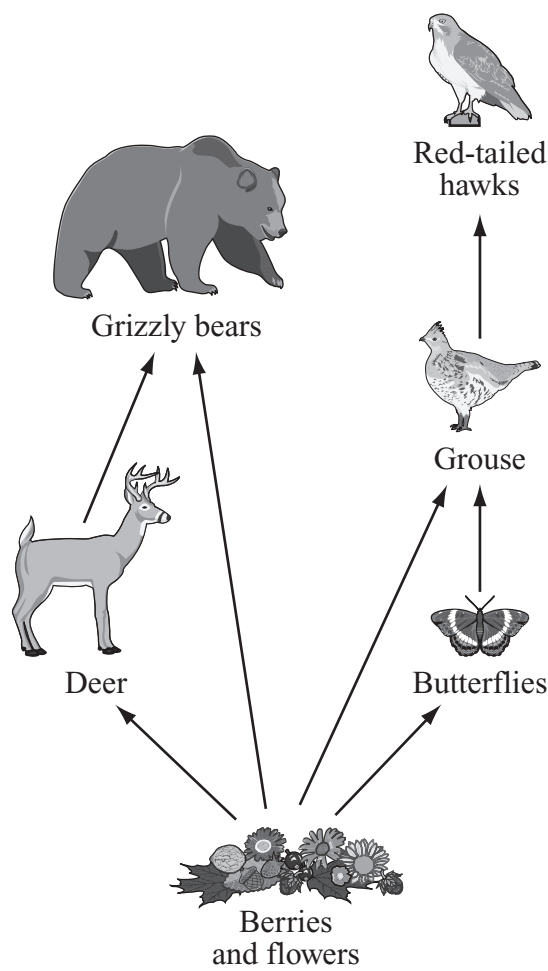


What always happens within cells as a result of ATP hydrolysis?

- A. Water is produced.
- B. Chemical energy is released.
- C. Phosphorus atoms are used up.
- D. Carbohydrate building blocks are formed.

- 35 Which of the following statements **best** compares reproduction in viruses with reproduction in single-celled protists?
- A. Viruses reproduce by releasing spores; single-celled protists reproduce by dividing in half.
  - B. Viruses require large colonies to reproduce; single-celled protists reproduce as individual cells.
  - C. Viruses require the cellular machinery of host cells to reproduce; single-celled protists reproduce on their own.
  - D. Viruses form haploid gametes when they reproduce; single-celled protists form diploid gametes when they reproduce.
- 36 Each part of the human digestive system has a specific function. Which of the following activities best models the role of the esophagus?
- A. shaking a small piece of chalk in a plastic bottle
  - B. cutting a clay cube into smaller and smaller cubes
  - C. squeezing a small greased ball through plastic tubing
  - D. placing a small piece of egg in dilute hydrochloric acid
- 37 Beginning with one parent cell, how many daughter cells are typically produced from one mitotic division?
- A. 1
  - B. 2
  - C. 4
  - D. 8
- 38 Mature red blood cells in mammals contain the protein hemoglobin but do not contain a nucleus. The nucleus is lost as the red blood cell matures. Which of the following can be concluded about mammalian red blood cells from this information?
- A. The cells store their DNA in ribosomes.
  - B. The cells have no functionality once the nucleus is lost.
  - C. The cells divide by meiosis to produce more red blood cells.
  - D. The cells perform transcription and translation before the nucleus is lost.

39 A partial food web is shown below.



Which of the following will most likely occur if the grouse population decreases?

- A. The butterfly population will increase.
- B. The red-tailed hawk population will increase.
- C. Emigration of grizzly bears and deer will increase.
- D. Competition between grizzly bears and deer will increase.

40 A type of golden brown coat color in horses is called palomino. Several pairs of palomino horses are mated. The results of the crosses are shown in the table below.

Coat Color	Percent of Offspring
palomino	50%
reddish-brown	25%
creamy white	25%

Which of the following is the **most likely** inheritance pattern of coat color in horses?

- A. complete dominance
- B. incomplete dominance
- C. polygenic inheritance
- D. sex-linked inheritance

- 41 Which of the following statements explains the importance of enzymes that check for and repair mistakes during DNA replication?
- A. The enzymes replace the DNA with RNA.
  - B. The enzymes speed up the rate of RNA synthesis.
  - C. The enzymes remove many recessive gene copies from the nucleus.
  - D. The enzymes prevent many genetic mutations from being expressed.
- 42 Four boys have the same biological mother and father. What percentage of each boy's chromosomes come from the mother?
- A. 0%
  - B. 25%
  - C. 50%
  - D. 100%
- 43 Scientists often compare fossils of extinct organisms with living organisms to help determine evolutionary relationships. What is the **primary** information that scientists use when comparing fossils with living organisms?
- A. the types of minerals that formed the fossils
  - B. the size of the rocks that contained the fossils
  - C. the cause of death for the fossilized organisms
  - D. the physical characteristics of the fossilized organisms

Questions 44 and 45 are open-response questions.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 44 in the space provided in your Student Answer Booklet.

**44** Antibiotics are medicines used to treat bacterial infections in humans. Some antibiotics work by interfering with the bacteria's ribosomes. Other antibiotics work by interfering with the bacteria's plasma membrane.

- Describe the function of the ribosomes **and** explain why interfering with the ribosomes would kill the bacteria.
- Describe the function of the plasma membrane **and** explain why interfering with the plasma membrane would kill the bacteria.

Medicines called antifungals are used to treat infections caused by fungi. One way antifungals work is by targeting cell parts that are present in fungal cells but not in human cells.

- Identify **one** cell part other than a ribosome or a plasma membrane that human cells and fungal cells have in common.
- Describe what would happen to a human cell if the cell part you identified in part (c) were affected by an antifungal. Explain your answer based on the function of the cell part.

Write your answer to question 45 in the space provided in your Student Answer Booklet.

- 45 The table below lists the ecological roles of several organisms in a rainforest ecosystem.

Organism	Ecological Role
fig tree	producer
jaguar	secondary consumer
mango tree	producer
monkey	primary consumer
toucan bird	primary consumer

- a. In your Student Answer Booklet, draw a food web that includes **all** the organisms listed in the table. Make sure the arrows represent the correct direction of energy flow.

Decomposers, such as bacteria, are not listed in the table.

- b. Describe the role of decomposers in the rainforest ecosystem.
- c. Describe what would most likely happen to producer populations **and** consumer populations if all decomposers in an ecosystem were removed. Explain your answer for **each** type of population.



**Biology**  
**February 2016 Released Items:**  
**Reporting Categories, Standards, and Correct Answers\***

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)
1	5	<i>Biochemistry and Cell Biology</i>	1.1	B
2	5	<i>Ecology</i>	6.2	A
3	6	<i>Evolution and Biodiversity</i>	5.2	D
4	6	<i>Biochemistry and Cell Biology</i>	2.2	B
5	7	<i>Ecology</i>	6.3	B
6	7	<i>Anatomy and Physiology</i>	4.4	C
7	8	<i>Evolution and Biodiversity</i>	5.1	C
8	10	<i>Biochemistry and Cell Biology</i>	2.1	B
9	10	<i>Genetics</i>	3.6	D
10	10	<i>Genetics</i>	3.3	B
11	10	<i>Genetics</i>	3.1	A
12	11	<i>Genetics</i>	3.6	
13	12	<i>Biochemistry and Cell Biology</i>	2.7	A
14	12	<i>Biochemistry and Cell Biology</i>	2.4	C
15	13	<i>Evolution and Biodiversity</i>	5.3	B
16	14	<i>Anatomy and Physiology</i>	4.7	C
17	14	<i>Biochemistry and Cell Biology</i>	2.3	C
18	15	<i>Evolution and Biodiversity</i>	5.3	C
19	15	<i>Ecology</i>	6.4	A
20	15	<i>Evolution and Biodiversity</i>	5.1	B
21	16	<i>Evolution and Biodiversity</i>	5.3	D
22	16	<i>Anatomy and Physiology</i>	4.5	B
23	17	<i>Anatomy and Physiology</i>	4.8	
24	18	<i>Ecology</i>	6.1	A
25	18	<i>Biochemistry and Cell Biology</i>	2.4	A
26	19	<i>Ecology</i>	6.1	B
27	19	<i>Ecology</i>	6.2	D
28	20	<i>Ecology</i>	6.4	C
29	20	<i>Evolution and Biodiversity</i>	5.1	C
30	21	<i>Biochemistry and Cell Biology</i>	1.2	A
31	21	<i>Genetics</i>	3.1	A
32	22	<i>Evolution and Biodiversity</i>	5.2	
33	23	<i>Biochemistry and Cell Biology</i>	1.3	A
34	23	<i>Biochemistry and Cell Biology</i>	2.5	B
35	24	<i>Biochemistry and Cell Biology</i>	2.8	C
36	24	<i>Anatomy and Physiology</i>	4.1	C
37	24	<i>Biochemistry and Cell Biology</i>	2.6	B
38	24	<i>Genetics</i>	3.2	D
39	25	<i>Ecology</i>	6.3	A
40	25	<i>Genetics</i>	3.4	B
41	26	<i>Genetics</i>	3.3	D
42	26	<i>Anatomy and Physiology</i>	4.6	C
43	26	<i>Evolution and Biodiversity</i>	5.1	D
44	27	<i>Biochemistry and Cell Biology</i>	2.1	
45	28	<i>Ecology</i>	6.3	

\* Answers are provided here for multiple-choice items only.